Code No.

Symbol Number: _____ Invigilator's Sign: _____ Superintendent's Sign: _____

Symbol No. in Words: _____

Faculty: Engineering **Level: Bachelor** **Exam Year:2080 Mangsir** **Year/Part: II/I**

Program: Civil Engineering **Subject: Strength of Materials (EG503CE)**

GROUP A (Multiple Choice Questions) **[10x1=10]**

i. Answers should be given by filling the Objective Answer Sheet.
ii. Rough can be done in the main answer sheet
iii. The figure in the margin indicate full marks
iv. Assume suitable data if necessary

1) Which support is commonly found in bridges to accommodate expansion and contraction due to temperature changes?
   a. Roller Support b. Fixed Support c. Hinged Support d. Flexible Support

2) A determinate frame can be statically analysed by using
   b. Matrix Inversion Method
   b. Energy methods only
   c. Equations of equilibrium
   d. Iterative techniques

3) For a plane area, the product of inertia with respect to the x and y axes is given by
   a. Ixy = ∫∫(x*y)dA
   b. *Ixy* = ∫∫*(x+dA)*(y+dA)
   c. Ixy = ∫∫(x*dA)*(y*dA)*
   d. *Ixy* = ∫∫*(x*dA) + ∫∫(y*dA)

4) A material with stress concentration tends to experience
   a. Higher localized stresses than anticipated b. Uniform distribution of stress
   c. Lower stress than predicted by theory d. No change in stress distribution

5) The relationship between Young's modulus (E), rigidity modulus (G), and bulk modulus (K) for isotropic materials is:
   a. E = 2G(1 + ν), K = E/3(1 - 2ν)
   b. E = 3G(1 - 2ν), K = 2G(1 + ν)
   c. E = 3G(1 + ν), K = 2G(1 - ν)
   d. E = 2G(1 - ν), K = 3G(1 + 2ν)

6) The maximum shear stress in a plane stress situation occurs on planes oriented at an angle of:
   a. 0 degrees b. 45 degrees c. 60 degrees d. 90 degrees

7) Which type of failure is most likely to occur in a thin-walled pressure vessel due to excessive internal pressure?
   a. Yielding of material b. Buckling c. Shear failure d. Creep failure

8) The rotational speed (ω) of a shaft is measured in units of:
   a. Radians per second (rad/s)
   b. Revolutions per minute (RPM)
   b. Hertz (Hz)
   d. Meters per second (m/s)

Multiple Choice Questions' Answer Sheet

Code No. _____ Marks Secured: _____

In Words: _____

Examiner's Sign: _____ Date: _____

Scrutinizer's Marks: _____

In Words: _____

Scrutinizer's Sign: _____ Date: _____

Corrected Fill Ⓐ ● Ⓒ Ⓓ

Incorrected Fill ✗Ⓐ Ⓑ ● ✓Ⓓ

1.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	6.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
2.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
3.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
4.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
5.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ

MANMOHAN TECHNICAL UNIVERSITY
Office of the Controller of Examinations
Budhiganga-4, Morang, Province 1, Nepal

Faculty: Engineering | **Exam Year:2080 Mangsir** | **Year/Part: II/I**
Program: Civil Engineering | **Level: Bachelor** | **F.M.: 50**
Time: 3 Hours | **P.M.: 20**

Subject: Strength of Materials (EG503CE

- ✓ *Group A contains Multiple Choice Questions of 10 marks.*
- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary*.

9) The equation for the deflection of a simply supported beam uniformly loaded over its entire length (w) and a span (L) is given by:
a. $\delta = 5wL^4/384EI$ b. $\delta = wL^3/24EI$ c. $\delta = wL^4/8EI$ d. $\delta = wL^3/48EI$

10) When a column is "slender," it implies that:
b. The column is short and stubby b. The column is long and slender
c. The column is prone to buckling d. The column is perfectly stable

Group B (Attempt any eight questions) [8*2=16]

1. Explain Concept of Axial Force, Shear Force and Bending Moment in a section of Beam.
2. Explain Mohr's circle for moment of Inertia of a section.
3. Elaborate Stress-Strain diagram of mild Steel.
4. What is Stress Concentration? What effect is Produced in brittle material due to stress concentration?.
5. Explain Principle stress and Principle plane.
6. Explain the different type of Stresses in thin walled cylinder.
7. Explain about shaft, torsion, torque and angle of twist.
8. Write down about section-modulus.
9. What is effective length of column?

Group C(Attempt all questions)

10. Draw axial force, Shear force and bending moment diagram for the given frame. Indicate Salient points if necessary(Figure-1) [8]
11. Find the principal axes and principal moments of inertia for the given section.(Figure-2) [4]

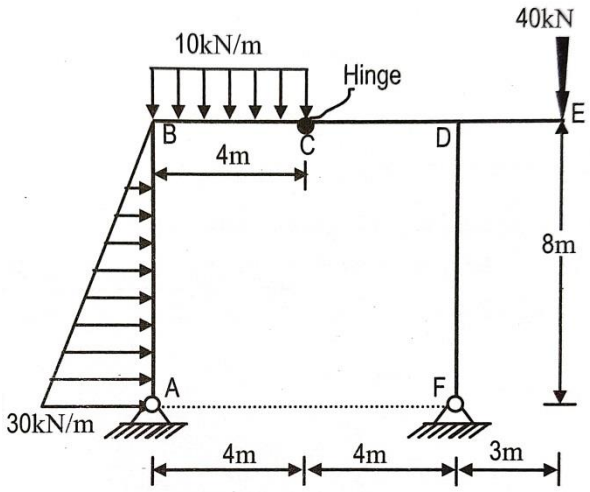


Figure-1

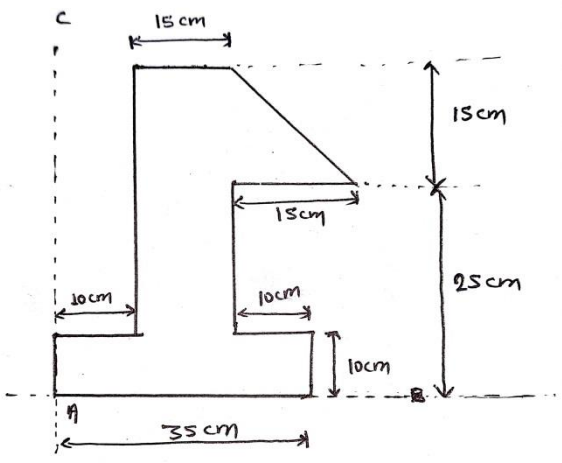


Figure-2

1. A composite bar made up aluminum and steel is fixed between support as shown in figure. The bars are stress-free at a temperature of 40°C. Determine the stresses in the two bars when temperature falls 15°C, if (a) The support are unyielding and (b) the support comes nearer to each other by 0.1mm. (Figure-3) [4]

   Take: Es=2.10 x10^5N/$mm^2$and α_s=11.70 x10^{-6}/°C

   Take: E_A=0.74 x10^5N/$mm^2$and α_A=23.40 x10^{-6}/°C

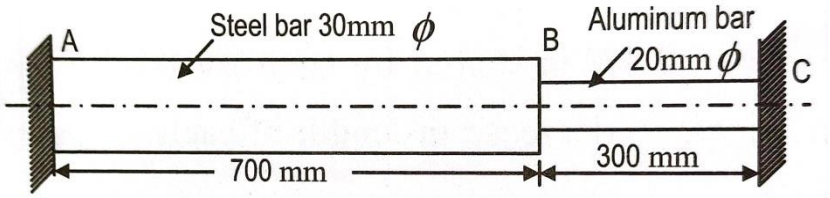


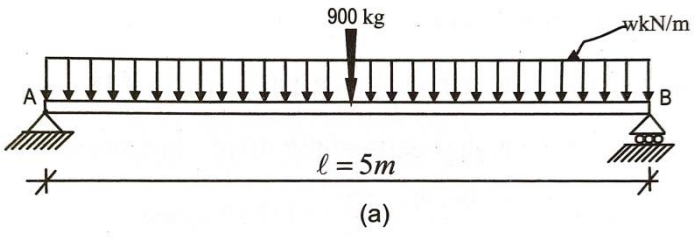
Figure-3

2. Write down assumptions and Derive torsional Equation of Solid Circular shaft. [4]

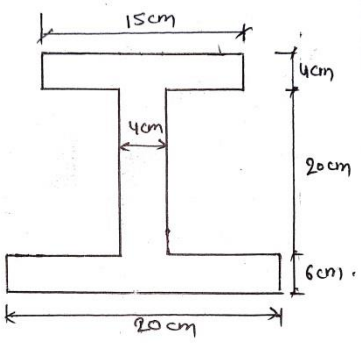
   Or

   Write down assumptions and Derive Euler's Formula when both end of the column are hinged. [4]

3. A simply, Supported Beam of length 5m is carrying a UDL of w KN/m. The cross-section of the beam is given below. If permissible bending stress are 160 kg/cm^2 in tension and 200kg/cm^2in compression. Find the moment of resistance of the section, actual maximum stress and external UDL (w) carrying capacity of the beam if 900kg point load at center is applied.(Figure-4) [4]



(a)



(b)

Figure-4

***** **All the Best** ***